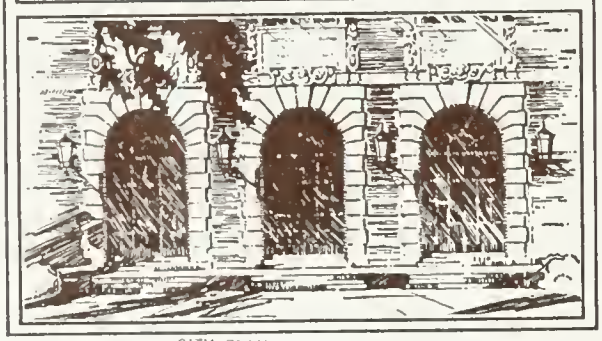

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THE PSYCHOLOGY AND PHYSIOLOGY OF LIGHT AND COLOR AS AN ISSUE IN THE PLANNING AND MANAGING OF ENVIRONMENTS: A Selected Bibliography

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The study of light and lighting is not circumscribed by any one profession nor by any one discipline considered separately. In fact, light[1] is studied by lighting engineers, architects, psychologists, physiologists, color consultants, biologists, opthalmolcgists and others. Typically, such an array presents one with problems: not only are there problems of communication between these professions, but there are also the problems of differing goals and purposes between these same groups. For instance, a lighting engineer is interested in the specification of light and lighting equipment to satisfy certain standards of illumination; an opthalmdogist is interested in the effects of light and color on the human eye; an architect is interested in the design of environments (including light, temperature, and so on) to suit defined human activities and purposes.

[1] I have used the term 'light' throughout this introduction in the interest of consistency; however, that does not prejudice my inclusion of color since the two are inseparable as topics of study. Perhaps it would have been helpful to say "light and/or color" each time, but I chose not to. Also, it is possible for one to be most interested in either light or color-recognizing that the two are inseparable and that one should recognize both as influences-and my use of the term 'light' probably reflects my greater interest in the light and lighting aspects of these matters.

For reasons which stem from such problems, I have recently attempted several literature searches in an effort to find material relevant to the "psychology of light." There are several reasons for this approach: (1) I find it interesting to read about research or discussion on lighting conducted by people in other disciplines; (2) in order to understand what is being said by these different people, it is helpful to obtain a selection of purposes and assumptions from a variety of sources; and (3) it has been my hope that the understanding of diverse points of view on a similar topic will aid in a more precise understanding of my own work, affording new ideas for study as well as helping to evaluate the utility of my conceptual approach as compared to another.

I have been particularly interested in conceptual approaches which have some relevance to the application of ideas about light to the design of environments and to the study of environmental influences on behavior. Accordingly, conceptual approaches which focus on the biological effects of light upon the human eye are peripherally relevant; conceptual approaches which focus on perceptual idiosyncracies, visual afterimages, cortical responses, and the like are judged as not relevant; further, conceptual approaches which emphasize systems theory, information theory, cross modal perceptual influences, perceptual theory which includes the environment, and molar conceptions of the environment are preferred to conceptual approaches which emphasize individual stimuli, the perception of point light sources, and the measurement of color discrimination. My interest in conceptual approaches is also limited by my interest in <u>human</u> behavior. Although I cannot deny the scientific value of studying rats, cats, frogs, fish, earthworms, pigeons, chicken, ducks, starlings, planaria, Hydra,

squirrels, sockeye salmon, rabbits, houseflies, spiders, turtles, and rhesus monkeys,[2] I am not very adept at applying such research to the issues of the design of environments for people.

As a consequence of this literature search, I have begun to think of two broadly conceived conceptual approaches to the study of light and lighting. Roughly speaking, one is academic and the other is practical. Each of these approaches subsumes other categories which are more closely related to delimited areas of interest. I will discuss the academic approach first.

One reasonable way to characterize the academic approach centers on the fact that much of the work is conducted by an experimenter. Whether laboratory or naturalistic settings are used, there is usually a well defined system of variables manipulated and variables measured. Perhaps this approach is best considered as the psychological and/or physiological approach, since those are the two fields of study which readily qualify in this kind of work. Within this broad conceptual approach, two categories emerge: the psychological-minute and the psychological-global. Someone studying the perception of color chips, contrast, form discrimination, or light sensitivity is working at the psychological-minute level. Someone studying preferences for lighting installations, affect as related to light and color, or the interpretation of Rorschach test results as an indicator of personality is working at the psychological-global level. Often, this work is good research work; unfortunately, the variables are usually trivial and more closely related

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[2] This list of subjects was culled from one volume of the Psychological Abstracts Index from articles which were referenced under the category: 'light'.

to implications for personality assessment than to implications for planning environments.

The practical approach may be characterized as the study and application of light and color theories in actual design situations. Within this broad category are two conceptually distinct professions: color consultant, and lighting engineer. Although this approach is not characterized by laboratory experiments, it does afford an important attitude about the design of environments. That is, there are some color consultants and lighting engineers who are likely to view each design application as an experiment, rather than viewing it as a final expression of well defined practices.[3] Therefore there may be a system of variables--manipulated and measured--in this approach which one may not have expected. In any event, there is an attempt to hypothesize and test out various ideas, and to that extent there is research work conducted here as well as in the academic approach. Often this work is not good research work: it has poorly defined measures and inadequate testing situations. At times the variables may be consciously manipulated, but nothing is measured as an evaluation. However, this research is conducted on variables in which we are most interested: the applications are "real-life," the measures are relevant to human behavior, and the behaviors studied are ones which have consequences in our everyday lives.

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[3] Of course, not all color consultants and lighting engineers hold this view; furthermore, I am unclear as to why some hold this view and others don't. Short of ascribing some personality characteristics as differentiating criteria, perhaps it would be best to say that the designers and engineers who presently recognize research as a valid tool of a design process are more likely to hold this view than their unenlightened colleagues.

Of course, there are problems with the characterizations which I have presented; I am aware of the discipline-determined nature of the categories and the temptation to present these four characterizations (psychological-minute, psychological-global, color consultant, lighting engineer) as an adequate way to classify the work which is presently being conducted. They are not; they merely give a picture of the traditional fields from which today's lighting research is likely to emerge. Happily, there are some studies which pay no attention to these categories, proceeding to study interesting phenomena on grounds which are relevant to environmental design. We desperately need much more of that kind of work.

This bibliography is not without its own peculiar limits. There was ample opportunity to increase the number of references to six or seven times the number included, but I felt somewhat uncomfortable with most of them as examples of interesting work. Furthermore, that number would not have included the extensive references of some of the works included in this list.[4] The material which follows is strong in its consideration of the work of color consultants and lighting engineers. Most of the early work in this field (notably, most of the work of Matthew Luckiesh and his collegues) has not been included.[5] This material is not so strong in its consideration of foreign work, nor in its consideration of work from the psychological-global characterization. The list is nearly devoid

[4]For instance, the Architectural Research Laboratory's book: Environmental Abstracts, includes annotated references to (seemingly) hundreds of publications; Faber Birren's book: Light, Color and Environment, Bishop and Henry's chapter: "Spatial Vision", and the ERIC article: "Effects of facilities on educational achievement" each have vast reference lists.

[5]Much of the early work in this field is reviewed by the Architectural Research Laboratory (Ser 1: Environmental Abstracts).

of references to the architectural periodicals due to the superficial treatment and the limited opportunities for objective behavioral evaluation (there is opportunity for limited esthetic evaluation) of the lighting designs presented there.

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